AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims:

1. (Currently Amended) A method for processing of a multi-dimensional dataset corresponding to an imaging volume, the method comprising:

accessing the multi-dimensional dataset;

isolating a selected region of interest from the multi-dimensional dataset, said selected region of interest comprising a subset of the imaging volume;

generating a plurality of differential operators for the selected region of interest, separate from the multi-dimensional dataset, using a discrete approximation of an analytic function; [[and]]

forming a plurality of geometric responses based on a plurality of differential operators resultant from said generating;

identifying a plurality of discrete derivative approximations that when convolved with said analytic function, approximates an analytical derivative of said analytic function; and

optimizing said discrete derivative approximations in a least squares sense to reduce an error between said plurality of discrete derivative approximations and said analytical derivative of said analytic function;

wherein isolating the selected region of interest further includes isolating lung tissue for a pair of lungs, including:

filtering with a high threshold algorithm to isolate solid tissue and bone;

filling holes with a three-dimensional hole filling algorithm to fill a portion of remain contained inside said solids;

filtering with a low threshold algorithm to isolate parenchyma of a pair of lungs from the solid tissue and bone;

splitting and isolating said pair of lungs with a morphology erosion algorithm;

closing and filling airways and vascular structures entering said pair of lungs with a morphology closure algorithm; and

filling remaining holes with a three-dimensional hole filling algorithm to yield another multidimensional dataset corresponding to the selected region of interest.

2. (Original) The method of Claim 1 further including scale-space processing the multi-dimensional dataset with multi-resolution sampling.

3. (Original) The method of Claim 2 further comprising:

iterating said generating and forming over several scales to determine said plurality of responses for each scale; and

determining said plurality of geometric responses based on said iterating.

4. (Previously Presented) The method of Claim 1 further comprising:

filtering the multi-dimensional dataset with a smoothing kernel based on said analytic function; said smoothing kernel generating a filtered multi-dimensional dataset.

5. (Original) The method of Claim 1 wherein said analytic function is a Gaussian.

6. (Original) The method of Claim 1 wherein said plurality of differential operators correspond to an n-th derivative of said analytic function, where n is greater than or equal to one.

7. (Cancelled)

8. (Cancelled)

9. (Cancelled)

10. (Cancelled)

11. (Cancelled)

12. (Previously Presented) The method of Claim 11 further including isolating the selected region of interest from at least one of said multi-dimensional dataset and said downsampled multidimensional dataset.

13. (Original) The method of Claim 11 wherein said isolating a selected region of interest includes image threshold filtering and a morphology process configured to eliminate unnecessary portions of the imaging volume.

14. (Original) The method of Claim 1 wherein said processing of a multi-dimensional dataset is executed in less than one minute.

15. (Currently Amended) A method for processing of a multi-dimensional dataset corresponding to an imaging volume, the method comprising:

processing the multidimensional dataset with multi-resolution sampling to establish a downsampled multidimensional dataset;

identifying a region of interest from the multi-dimensional dataset; said region of interest comprising a subset of the imaging volume;

processing said downsampled multidimensional dataset based on said region of interest and establishing a multi-dimensional datasubset;

filtering the multi-dimensional datasubset, separate from the multi-dimensional dataset, with a smoothing kernel based on an analytic function; said smoothing kernel generating a filtered multi-dimensional datasubset;

generating a plurality of differential operators for the multi-dimensional datasubset using a discrete approximation of an analytic function; [[and]]

forming a plurality of geometric responses based on a plurality of differential operators resultant from said generating;

identifying a plurality of discrete derivative approximations that when convolved with said analytic function, approximates an analytical derivative of said analytic function; and

optimizing said discrete derivative approximations in a least squares sense to reduce an error between said plurality of discrete derivative approximations and said analytical derivative of said analytic function;

wherein identifying a region of interest further includes isolating lung tissue for a pair of lungs, including:

filtering with a high threshold algorithm to isolate solid tissue and bone;

filling holes with a three-dimensional hole filling algorithm to fill a portion of remain contained inside said solids;

filtering with a low threshold algorithm to isolate parenchyma of a pair of lungs from the solid tissue and bone;

splitting and isolating said pair of lungs with a morphology erosion algorithm;

closing and filling airways and vascular structures entering said pair of lungs with a morphology closure algorithm; and

filling remaining holes with a three-dimensional hole filling algorithm to yield another multidimensional dataset corresponding to the selected region of interest.

16. (Previously Presented) A method for processing of a multi-dimensional dataset in a multi-resolution framework comprising:

isolating a selected region of interest from said multidimensional dataset and establishing a multidimensional datasubset, said selected region of interest comprising a subset of the imaging volume;

convolving said multidimensional datasubset, separate from the multi-dimensional dataset, with an analytic function to obtain a first convolution product;

determining a plurality of discrete derivative approximations to an analytic function and optimizing said discrete derivative approximations in a least squares sense to reduce an error between said plurality of discrete derivative approximations and an analytical derivative of said analytic function;

convolving said first convolution product with the plurality of discrete approximations of partial derivatives of an analytic function to create a plurality of second convolution products;

forming a plurality of Hessian matrices from said plurality of second convolution products;

determining a plurality of eigenvalue decompositions for said plurality of said Hessian matrices; and

combining eigenvalues resultant from said decompositions to represent spherical and cylindrical responses to elements of said multidimensional datasubset;

wherein isolating a selected region of interest further includes isolating lung tissue for a pair of lungs, including:

filtering with a high threshold algorithm to isolate solid tissue and bone;

filling holes with a three-dimensional hole filling algorithm to fill a portion of remain contained inside said solids;

filtering with a low threshold algorithm to isolate parenchyma of a pair of lungs from the solid tissue and bone;

splitting and isolating said pair of lungs with a morphology erosion algorithm;

closing and filling airways and vascular structures entering said pair of lungs with a morphology closure algorithm; and

filling remaining holes with a three-dimensional hole filling algorithm to yield another multidimensional dataset corresponding to the selected region of interest.

17. (Currently Amended) A system for processing of a multi-dimensional dataset corresponding to an imaging volume, the system comprising:

a means for accessing the multi-dimensional dataset;

a means for isolating a selected region of interest from the multi-dimensional dataset, said selected region of interest comprising a subset of the imaging volume;

a means for generating a plurality of differential operators for the selected region of interest, separate from the multi-dimensional dataset, using a discrete approximation of an analytic function; and

a means for forming a plurality of geometric responses based on a plurality of differential operators resultant from said generating;

wherein generating the plurality of differential operators includes:

identifying a plurality of discrete derivative approximations that when convolved with said analytic function, approximates an analytical derivative of said analytic function; and

optimizing said discrete derivative approximations in a least squares sense to reduce an error between said plurality of discrete derivative approximations and said analytical derivative of said analytic function;

wherein isolating a selected region of interest further includes isolating lung tissue for a pair of lungs, including:

filtering with a high threshold algorithm to isolate solid tissue and bone;

filling holes with a three-dimensional hole filling algorithm to fill a portion of remain contained inside said solids;

filtering with a low threshold algorithm to isolate parenchyma of a pair of lungs from the solid tissue and bone;

splitting and isolating said pair of lungs with a morphology erosion algorithm;

closing and filling airways and vascular structures entering said pair of lungs with a morphology closure algorithm; and

filling remaining holes with a three-dimensional hole filling algorithm to yield another multidimensional dataset corresponding to the selected region of interest.

18. (Currently Amended) A system for processing of a multi-dimensional dataset corresponding to an imaging volume, the system comprising:

an imaging system comprising;

a radiation source configured to generate a radiation beam incident upon an object,

a radiation detector, said radiation detector configured to receive an attenuated radiation beam responsive to said radiation beam incident upon said object and produce an electrical signal responsive to an intensity of attenuated radiation beam, and

wherein said radiation source and said radiation detector disposed about an object cavity;

a processing device in operable communication with said radiation detector configured to execute a method for processing of a multi-dimensional dataset corresponding to an imaging volume, the method comprising;

accessing the multi-dimensional dataset,

isolating a selected region of interest from the multi-dimensional dataset, said selected region of interest comprising a subset of the imaging volume,

generating a plurality of differential operators for the selected region of interest, separate from the multi-dimensional dataset, using a discrete approximation of an analytic function, [[and]]

forming a plurality of geometric responses based on a plurality of differential operators resultant from said generating;

identifying a plurality of discrete derivative approximations that when convolved with said analytic function, approximates an analytical derivative of said analytic function; and

optimizing said discrete derivative approximations in a least squares sense to reduce an error between said plurality of discrete derivative approximations and said analytical derivative of said analytic function;

wherein isolating a selected region of interest further includes isolating lung tissue for a pair of lungs, including:

filtering with a high threshold algorithm to isolate solid tissue and bone;

filling holes with a three-dimensional hole filling algorithm to fill a portion of remain contained inside said solids;

filtering with a low threshold algorithm to isolate parenchyma of a pair of lungs from the solid tissue and bone;

splitting and isolating said pair of lungs with a morphology erosion algorithm;

closing and filling airways and vascular structures entering said pair of lungs with a morphology closure algorithm; and

filling remaining holes with a three-dimensional hole filling algorithm to yield another multidimensional dataset corresponding to the selected region of interest.

19. (Currently Amended) A computer data storage device, said computer data storage device including computer readable program code, the computer readable program code comprising a method for processing of a multi-dimensional dataset corresponding to an imaging volume, the method comprising:

accessing the multi-dimensional dataset;

isolating a selected region of interest from the multi-dimensional dataset, said selected region of interest comprising a subset of the imaging volume;

generating a plurality of differential operators for the selected region of interest, separate from the multi-dimensional dataset, using a discrete approximation of an analytic function; [[and]]

forming a plurality of geometric responses based on a plurality of differential operators resultant from said generating;

identifying a plurality of discrete derivative approximations that when convolved with said analytic function, approximates an analytical derivative of said analytic function; and

optimizing said discrete derivative approximations in a least squares sense to reduce an error between said plurality of discrete derivative approximations and said analytical derivative of said analytic function;

wherein isolating a selected region of interest further includes isolating lung tissue for a pair of lungs, including:

filtering with a high threshold algorithm to isolate solid tissue and bone;

filling holes with a three-dimensional hole filling algorithm to fill a portion of remain contained inside said solids;

filtering with a low threshold algorithm to isolate parenchyma of a pair of lungs from the solid tissue and bone;

splitting and isolating said pair of lungs with a morphology erosion algorithm;

closing and filling airways and vascular structures entering said pair of lungs with a morphology closure algorithm; and

filling remaining holes with a three-dimensional hole filling algorithm to yield another multidimensional dataset corresponding to the selected region of interest.

20 - 21. (Cancelled)